8 The human sciences

ASK FIVE ECONOMISTS AND YOU'LL GET FIVE DIFFERENT ANSWERS (SIX IF ONE WENT TO HARVARD).
Edgar R. Fiedler

The social sciences are good at accounting for disasters once they have taken place.
Claude T. Bissell

A large part of the popularity and persuasiveness of psychology comes from its being a sublimate spiritualism: a secular, ostensibly scientific way of affirming the primacy of 'spirit' over matter.
Susan Sontag

Capitalism is the astounding belief that the most wickedest of men will do the most wickedest of things for the greatest good of everyone.
J. M. Keynes

Wall Street indices predicted nine out of the last five recessions!
Paul A. Samuelson

To say that a farm boy knows how to milk a cow is to say that we can send him out to the barn with an empty pail and expect him to return with milk. To say that a criminologist understands crime is not to say that we can send him out with a grant or a law and expect him to return with a lower crime rate. He is more likely to return with a report on why he has not succeeded yet, and including the inevitable need for more money, a larger staff, more sweeping powers, etc.
Thomas Sowell

Trying to define yourself is like trying to bite your own teeth.
Alan Watts

Physicists have a subject matter, but sociologists study only methods.
Henri Poincaré

Those who have knowledge, don't predict. Those who predict, don't have knowledge.
Lao Tzu

ECONOMICS IS EXTREMELY USEFUL AS A FORM OF EMPLOYMENT FOR ECONOMISTS.
John Kenneth Galbraith

Psychiatry's chief contribution to philosophy is the discovery that the toilet is the seat of the soul.
Alexander Chase

An economist is an expert who will know tomorrow why the things he predicted yesterday didn't happen today.
Laurence J. Peter

Aims By the end of this chapter you should:

- understand how the human sciences differ from and resemble other areas of knowledge, especially the natural sciences
- understand the role played by reasoning in the human sciences
- understand some of the experimental issues which arise in the human sciences
- understand the position of ethics within the context of the human sciences
- appreciate the difficulties with concepts such as explanation and cause and effect in the humanities
- understand some of the underlying dilemmas in dealing with humans, such as the issues of free will, reductionism and the nature/nurture debate.

Introduction

To some, the idea of a science about humans seems like a contradiction in terms. Arguing that humans are the ultimate variables – we behave in incredible, bizarre and unpredictable ways – the critics suggest that science can never explain basic human nature; that there is something about humans which will forever escape theories and laws. Observing that the human world is based in feeling, emotion and values, they point to this as evidence that there can be no sciences of human behaviour. And they have a point. Certainly it cannot be denied that the study of humans has a fundamental element that is not present in the natural sciences; the study of humans involves the study of conscious creatures.

Despite this, fields of study which might once have called themselves humanities are increasingly going by the name of human sciences, and we might ask why this is. Perhaps it is because, in the early twenty-first century, the natural sciences set the standards for certainty and reliable knowledge, and so modelling psychology, linguistics, sociology, anthropology, economics and political theory on them may not be such a bad idea. Just as the goal of natural scientists is a deep understanding of nature, so human scientists seek explanation, order and underlying pattern in aspects of human behaviour. Since humans are, after all, a part of nature, we might not be too surprised to see that both natural and human sciences can share a common approach, but we must be alert to possible differences, too.

A Here are some statements of the kind made by human scientists. Identify why we might be suspicious of the hypotheses and potential problems with determining the truth.

- First-born children tend to be more successful in their careers.
- Hierarchical relationships are inevitable in human societies.
- High inflation causes unemployment.
- There is more social mobility in the USA than in the UK.
- The concept of 'social status' underlies different greeting rituals in different cultures.

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- Most boys have a subconscious sexual attraction to their mothers and feel jealous of their fathers.
- Distinct patterns can be observed in urban land use.
- The higher the price of a good, the lower the demand for that good.
- In any country, the second biggest city will be half the size of the biggest one; the third biggest city will be one-third of the size of the biggest one, and so on.
- Class is the determining factor in educational success.

B With what degree of certainty can these claims ever be known?
C Are they suitable for testing to determine their validity? If so, how?
D What is the difference between these 'laws' of human science and physical 'laws', such as 'water boils at 100°C' or 'e = mc^2'?
E Is it possible that the human sciences will ever produce statements of the same mathematical accuracy as the natural sciences? If so, give a possible example. If not, explain carefully why not.
F Individuals behave very strangely at times, and no scientist can accurately and reliably predict an individual's behaviour. However, in large numbers, humans seem to behave fairly predictably, which is why we can say that more people will go to the beach in warm weather than in cold. Although no scientist can predict quite who will be involved in car accidents in any given year, they can come very close to predicting the total number of accidents. Is there an analogy here with molecules within a gas and the pressure exerted by the gas?

Positive and normative statements

In my opinion, we don't devote nearly enough scientific research to finding a cure for jerks.

Bill Larson in Calvin and Hobbes

Many thinkers have argued that there is a fundamental difference between studying the objects of the natural world and the constructs of humans. When we investigate physics, chemistry and biology we seek to understand and to explain *how* things work. We wouldn't dream of suggesting how they *should* work – indeed such a claim would be pointless. This is in marked contrast to the human sciences where we study *how* things work in order to make them work better – or to make them work *as we think they should*. Why else study population movement, urban land use, crime, capitalism, socialism, communism or work efficiency unless to improve the situations that we have? As such, the human sciences have a prescriptive or **normative** aspect to them, as well as a descriptive or **positive** aspect. This is an important distinction: *positive* statements are statements of *fact*; *normative* statements go beyond this and are statements of *value*. For example:

Appraising staff takes around 60 hours a year. POSITIVE
This is an important task for middle managers. NORMATIVE

Men are generally more aggressive than women. POSITIVE
Aggression is a good trait in business. NORMATIVE

Crime costs insurance companies $12 billion a year. POSITIVE
We should always lock up criminals after one offence. NORMATIVE

Increasing the money supply leads to short-term unemployment. POSITIVE
Medium levels of unemployment are a price worth paying for a growing economy. NORMATIVE

The positive statements are either right or wrong. They can be tested, and like all good theories can potentially be falsified by looking at the evidence. Human scientists can do this sort of study if they can be precise enough about what they mean. The normative statements, on the other hand, cannot be tested in the same way. No evidence will tell you whether or not something is important or worth it because you cannot measure importance or worth by looking at evidence. A value judgement must be made, and this cannot be done from within the framework of the human sciences. The values come from outside the disciplines, and in many cases they boil down to ethics. Is it right to foster a very competitive environment in a workplace if it leads to unhappiness but greater profits? Is it right to sack people while the managing director gets a huge pay rise if the analysis shows that such action will push the share price up? If men and women are equal, is it right to have different retirement ages?

These questions cannot be answered by sticking to a purely positive footing. Any human science finding must be combined with an ethical attitude before it can be turned into a decision or policy. Conversely, any ethical or political decision must be based in the evidence provided by the human sciences before it can be said to be an informed decision. So we begin to see that the human sciences are an essential and vital part of modern society, but they must be complemented by a broader philosophical position on social justice and individual rights.

A Examine some economic policy from a recent issue of *The Economist* or *Newsweek*. Identify the positive and normative aspects of the policy.
B Do the natural sciences contain both positive and normative statements, or does one type of statement dominate? Why might the natural sciences be different to the human sciences in this respect?

Some experimental issues

It's hard to imagine anything more difficult to study than human sexuality, on every level from the technical to the political. One has only to picture monitoring orgasm in the lab to begin to grasp the challenge of developing testing techniques that are thorough and precise, yet respectful.

Winnifred Gallagher

Any science must have a good body of empirical evidence on which to base study, but accurate and informative experimentation is always difficult, and the human sciences present their own particular problems. Not least among these is

the sheer breadth of the scope of the human sciences – the techniques and problems found in psychology are very different to those found in economics, which themselves differ from those found in human geography. We cannot fully cover all the issues here, but the following examples show that experimentation in the human sciences can raise additional difficulties of a different nature to those found in the natural sciences.

For example, in two similar surveys during the Second World War people were asked about their opinion regarding post-war planning. The following results were obtained:

		In favour of planning for peace	Opposed to planning for peace	No opinion
Survey 1	Do you think we ought to start thinking now about the kind of peace we want after the war?	81% (yes)	14% (no)	4%
Survey 2	Which of these seems better to you: for us to win the war first and then think about the peace, or to start thinking now about the kind of peace we want after the war?	41% (start thinking about peace)	55% (win the war first)	4%

Source: National Opinion Research Centre, September 1942

The difference in results between the two surveys is clearly related to the nature of the questions asked. We might think that it would be easy to fix this – just ask the same question all the time. But which question is better? Perhaps the surveys were not really about eliciting opinions, but more about creating them. The people interviewed may never have thought about the issue before, but the nature of the questions made one of the answers very much more likely than the other. So we might conclude that we should stick to neutral questions, but which question is more neutral? In another case, a house-to-house survey was carried out with the aim of studying magazine readership. One of the questions was: 'What magazines does your household read?' This question seems neutral enough, but when the results were analysed most people seemed to read 'intelligent' magazines and very few seemed to read 'common' magazines. These findings were totally at odds with the publishers' data, which indicated the reverse. The most obvious explanation was that the surveys had been concentrated in a particular part of one town – for example, beside a university. But in fact the survey had been nationwide and had a very broad sample. The only conclusion is that people lied about their habits, and perhaps, in hindsight, this was not surprising. We all want to appear intelligent and sophisticated, especially in front of strangers asking questions about our personal lives.

Still more bizarre is the famous Hawthorne effect, named after a study at the Hawthorne plant of the Western Electric Company in 1927–29. The experiment involved monitoring the effect of changes in lighting on the rate of work of women assembling items. The experimenters measured a base rate, and then dimmed the lighting. They were pleased to find that efficiency improved, so they dimmed it some more, and efficiency improved again. More dimming yielded still further improvements, even though it was actually getting dark in the test room! Wondering what was going on, the experimenters began to turn the lights back up again, and incredibly, the efficiency of the workers continued to rise! It appears that the over-riding factor was the fact that the workers were the subject of an experiment; that someone was interested in what they were doing had very positive effects on their production level.

There is also a famous experiment where a team of industrial social psychologists went into an organisation to provide free 'counselling'. They were instructed to listen to whatever the workers wanted to say and to respond only by repeating whatever they were told, prefixed by phrases such as 'Am I correct in understanding that you are saying . . .'. The response to the experiment was overwhelmingly positive, with employees saying things like '[this is the] best thing the company has ever done' despite the fact that the 'counsellors' offered no real counselling.

These results serve as a vivid reminder that we are dealing with humans, not robots.

A How would you find an answer to the post-war planning issue in the example above?

B How would you find out what magazines people read? What would you do if you wanted to know, accurately, how many people in each house read each magazine?

C Take a controversial issue, such as abortion or euthanasia.

- Design a questionnaire which would 'persuade' most people to respond positively (e.g. pro-euthanasia).
- Design a questionnaire which would 'persuade' most people to respond negatively (e.g. anti-euthanasia).
- Design a neutral questionnaire which will elicit people's 'true' opinion.

D Design an experiment or questionnaire to determine the proportion of married 35–40-year-olds who are having an affair. You must consider the ethics of your research techniques. How much confidence would you have in your results?

Despite the problems that can be encountered in the human sciences, it is also worth mentioning the tremendous ingenuity which has gone into designing meaningful experiments. Pscyhology, in particular, is full of such examples, often because psychologists are trying to measure things like thoughts!

Imagine that in a criminal case the defendant says that he can't read, and that the whole case rests on finding out whether or not he is telling the truth. Remember that the defendant may

be a very ingenious and convincing liar, capable of excellent bluffing, so you can't just give a reading test. Perhaps the best approach is to use a technique which has been developed over the last 65 years – the so-called Stroop technique, whereby the subject is shown the word 'red' written in purple, the word 'yellow' written in blue and the word 'purple' written in orange. The subject is required to state the colour of the words. Now if the subject cannot read then the task is very easy – he just sees colours and says what he sees. But if he can read then the task is a little more difficult, as the meaning of the words contradicts the colours in which they are written, and the task takes a significantly longer time. Only those who can read suffer the interference between meaning and colour, and so it is easy to distinguish between the two cases.

Still more ingenious is a series of experiments from developmental psychology, which aims to show what a baby understands. Given that the baby cannot speak, this might seem like an impossible task, but it has been done. The basis of many of the experiments is a simple one – that babies look for longer at things in which they are interested. Suppose, for example, we wish to see if a baby has the concept of number and simple addition. A baby is shown a marble dropped into a box with no bottom. The box is lifted, and the baby sees the marble on the floor. The box is replaced and another marble is dropped in. Again, the box is lifted, and the baby can again see what is there. Now this is the clever bit – sometimes the psychologists have a trick whereby the second marble stays in the box, leaving only one marble on the floor when the box is lifted. In these cases, the baby consistently looks far longer at the remaining marble. The study has been duplicated many times, and the best interpretation seems to be that the baby knows something is strange and worthy of attention. For similar reasons, infants stare for a long time at an object seeming to hover in mid-air, but the same object on the floor gets hardly a second look.

A whole range of similar experiments have shown that even very young babies are sensitive to an enormous range of events, perhaps rather surprising those philosophers who believed in the infant as a *tabula rasa* or blank slate, waiting to be filled by a myriad of experiences. It appears that infants come into the world with a well developed sense of how things should behave.

We should perhaps remember that experimental difficulties may appear to be overwhelming, but that in fact they are not always insurmountable. Creativity, imagination and a willingness to try new ideas all play a large part in successful experimentation.

A Would it be possible to design an experiment to see whether blind babies have a similar feel for numbers?
B How might you determine whether or not new-born babies are more sensitive to the language that their parents spoke during pregnancy than to other languages?
C Would the same techniques work for telling if a child could recognise music that the mother heard often during pregnancy?

The reduction of social data to numerical form

If it can't be expressed in figures, it is not science; it is opinion.

Lazarus Long

In the search for accurate theories and predictions, the human sciences are increasingly turning to the language of the natural sciences – mathematics. However, we can quickly run into problems when we generate statistical data, especially when it relates to human activity. We may be aware of the famous phrase 'lies, damned lies and statistics', but it is not always clear exactly how devious statistics can be. Of course, unscrupulous tricksters can 'fiddle' information, and there may be little we can do about that – if we are told that GDP grew by 2 per cent then it may be hard for us, as non-experts, to know if this is true or not. We shall not be concerned with simple falsehoods here. Rather we shall show that sometimes even honest and well-meaning reporting of 'facts' can contain some very questionable assumptions, and indeed suggest results which, while not objectively 'false', are certainly not objectively 'true'.

Let us look back to the Olympic Games in Atlanta, 1996. This far after the event one might imagine that there is nothing of interest to debate – the races have been run, the medals awarded, the athletes have long gone and we know who won each event and who broke which record. But which country did best? Here are some selected results from those Olympics.

Country and ranking	G	S	B	Total
1 USA	44	32	25	221
2 Russia	26	21	16	136
3 Germany	20	18	27	123
4 China	16	22	12	104
5 France	15	7	15	74
6 Italy	13	10	12	71
7 Australia	9	9	23	68
23 Japan	3	6	5	26
33 North Korea	2	1	2	10
41 Indonesia	1	1	2	7
48 Thailand	1	0	1	4
52 Hong Kong	1	0	0	3
58 Malaysia	0	1	1	3
62 Taiwan	0	1	0	2
64 Philippines	0	1	0	2
71 India	0	0	1	1

A Which country did best? How do you know? Do you have any reasons to doubt the truth of your answer?

B The table was calculated on the basis of three points for a gold, two for a silver and one for a bronze. So three silvers = two golds (both worth six points) and three bronzes = one gold (both worth three points).
Would you prefer three silvers or two golds? What do you think an Olympic athlete would say?

C Most Olympic athletes would rather have one gold to five silvers, or ten bronzes. So how should we allocate points? How many silvers should equal one gold? How do you know?

There are other factors to consider, too. In the Olympics, some countries have a natural advantage. In China, the size of population provides a huge pool of talent. In other tiny states, even sending a team to the Olympics can seem fanciful! So here is an adjusted table; the points have been scaled to reflect different population sizes. In other words, the points have been adjusted to allow for the fact that some countries have bigger populations than others (the points have been divided by the population and multiplied by 100 million for clarity's sake).

Country and ranking	Points according to old calculation	Points according to new calculation
1 Tonga	2	1894
2 Bahamas	2	725
3 Cuba	51	464
4 Jamaica	11	437
5 New Zealand	14	389
6 Hungary	39	381
7 Australia	68	372
11 Ireland	10	279
12 Switzerland	18	254
13 Namibia	4	242
29 Italy	71	124
34 Russia	136	91
38 USA	221	83
46 Great Britain	46	43
47 North Korea	10	42
49 Mongolia	1	40

A Which country did best? How do you know?
B Do you have any reasons to doubt the truth of your answer?
C Is this a better method of calculating points than the first one? How do you know?

There might be other factors we should also take into account. Some countries are obviously wealthier than others, and so the population of these countries can devote more time to sports.

Perhaps we should therefore measure the GDP of each country and then scale the results in a similar way to the population scaling.

A What other factors might you need to consider when calculating points?
B Which factors are the important ones? How do you know?
C What can you say about the language used in a claim such as 'Country X did best'?
D So which country did best at the 1996 Atlanta Olympics?
E Identify another example where language or data presentation hides values and judgements behind a facade of fact.
F Look at the results from the recent Olympics and see what they tell you.

Of course, the Olympics provide us with data which is almost as simple as it could be. In any given event, we end up with an ordered list of names, and we are merely trying to aggregate the scores. But, even so, we still come across some rather difficult problems – imagine the problems in trying to describe human behaviour when we have more complex data! It is not difficult to see why many have declared that the whole notion is nonsense and that human behaviour cannot be reduced to underlying laws and structures.

However, the physical world also seems irreducibly complex to the untrained eye. It has taken thousands of years to discover that everything is made up of some hundred-odd elements, and that they, in turn, are all made up of identical protons, neutrons and electrons. We should not assume without good evidence that the same might not be true of the social sciences. When we look at the evidence, we find that the jury is very much out. In some areas – for example, sociology – there seems to be little consensus of opinion, and the discipline is largely descriptive; it may look scientific but in fact the theories have, as yet, little explanatory power. In other areas, however, such as linguistics, the progress made since the 1950s has been explosive and questions that once seemed to be total mysteries are now being investigated in highly focused, analytical and predictive ways. In a manner reminiscent of the convergence of thermodynamics and mechanics (where the former turned out to be the latter when looked at in the right way), linguistics is finding that it is consistent with dominant paradigms in other areas such as molecular genetics, information theory, neuroscience and Darwinian evolution. The story is a truly fascinating one, and seems to suggest that certain areas in the human sciences may be amenable to rigorous mathematical analysis. Regarding the humanities topic of the inflection of words, the linguist Stephen Pinker writes:

[This has] long been mulled over by novelists and poets, dictionary writers and editors, philologists and linguists. Now this topic straight out of the humanities is being probed with the cutting-edge tools of molecular genetics and imaging of the brain. Some people fear this kind of

development as crass 'reductionism' that will marginalise the humanities and plough under the richness of their subject matter, but it is far from that. Without an understanding of the contents of the mind from psychology, linguistics, and all the other disciplines that they touch, neuroscientists would not know where to begin studying the human brain, and their technologies would all be expensive toys. Ultimately all knowledge is connected, and an insight into a phenomenon can come from any direction.

This is not to say that numerical analysis will be, in the final instance, the ultimate arbiter of human truth. There is a big difference between information and wisdom, and some argue that, while mathematical tools of analysis may take us far, they will not really tell us about ourselves in any concrete and immediate way. Noam Chomsky writes:

It is quite possible – overwhelmingly probable, one might guess – that we will always learn more about human life and human personality from novels than from scientific psychology.

A What does Pinker mean when he speaks of a 'crass reductionism'?
B Does reductionism have to be crass?
C Do you think a rigorous mathematisation of the human sciences is possible? If not, why not? If so, is it desirable?
D Chomsky suggests that the arts may provide a vehicle for certain types of knowledge which the sciences (human or natural) cannot match. What types of knowledge do you think he means? Do you agree?

Causation in the human sciences

It would be enormously useful if we could positively identify the causes of our social problems. We might then be able to tackle them effectively and efficiently. Take crime as an example. Suppose we find that crimes are generally committed by poor people. Do we then say that poverty causes crime? Even this step is difficult to take (why?). Should we then say that to tackle crime we must attack poverty? So what are the causes of poverty? Again, we can't be sure of them and, even if we could, we could ask what caused them, and so on.

A One can imagine that crime is caused by poverty, poverty by unemployment, unemployment by high wage costs, high wage costs by crime ... So what is the cause of crime?
B Are there any equivalent problems in the natural sciences?
C A man has a heart attack while jogging. The following pieces of information are available. Which would you accept as a cause of his heart attack?

- He was given a new pair of jogging shoes for his birthday and wanted to try them.
- He had eaten far, far too much the previous week.
- He had always loved chocolate cake and had been unable to resist it for years.
- As a child he had associated his mother's chocolate cake with approval, since she rewarded him with extra pieces if he had done well.
- He loved his mother.
- Poor jogging shoes had, in the past, made his shins ache.
- He liked a sporty image.
- He would have liked his wife to think of him as a thwarted athlete.
- He was pleased that his wife gave him a sporty present.
- The road on which he was jogging was hilly.
- He is over 60 years old.
- Although basically fit, he hadn't been jogging for six weeks.
- His mother admired athletic prowess.
- He was born.
- He had jogged 15 km when he had the heart attack.
- He decided to go jogging at that moment because his wife and son were arguing.

Without any one of these factors, the man would not have had a heart attack. So what do we mean by **cause** in this case?

Of course, in this example we are asking an extremely difficult question – what is the cause of an event which is related to one single person? Normally the human sciences do not attempt such a difficult task – they look at much larger quantities of data and derive their theories from more statistically valid samples. However, there is another extremely easy mistake to make, which is especially common when the sample is larger. Consider these (made up, but representative) statistics, describing average lifetime earnings of people with different levels of education.

Educational level	Average lifetime earnings ($)
Left school at 16	750,000
Left school at 18	1,200,000
Bachelor's degree	2,025,000
Master's degree	2,640,000
Doctorate	2,000,000

The obvious conclusion, or at least the one often drawn by colleges in their recruitment drives, is that if you get a bachelor's or master's degree then you are more likely to earn far more than if you don't. Of course, we can find numerous exceptions – after all, it's not an exact science – but the general rule is clear. Education up to a master's degree results in higher earnings.

But this is wrong, all wrong! We need to look carefully to see a huge danger in dealing with this sort of data. There is a hidden assumption here that college-educated people earn more money, therefore it must be because they went to college. But that is far from clear – the high earners may have made just as much money, or even more, had they left the education system earlier. The type of students who enter academic education tend to be either bright or rich, and having either of these characteristics is often enough to command a high income in later life. So

correlation does not prove cause. The belief that because things occur together, one must cause the other is such a common error, or logical fallacy, that it has actually been given a name – *post hoc ergo propter hoc* – meaning 'after this, therefore because of this' (see also Chapter 5, page 91).

In the human sciences, there are several alternatives to simple causation. Sometimes it is very difficult to tell which is the cause and which is the effect (the more shares you own, the richer you tend to be). Sometimes there is genuine chance involved (and where computers can rapidly examine huge amounts of data spurious correlations will be found – apparently Scottish Highland rainfall levels have been very closely correlated to stock market levels). Sometimes there is a genuine correlation which, on inspection, appears to be the result of some underlying variable (in the college education example, the underlying variable is the type of student who goes to college).

Of course, just because the correlation does not prove the cause does not mean that there cannot be a causal relationship, but you have to look fairly hard to be sure. In the college education example, an alternative explanation may be, for example, that getting a qualification, which most people do at college, is the reason that many people earn a lot of money over their lifetimes. Or it may not. This is an empirical question which cannot be resolved from the correlation alone.

In some cases, a true causal link is denied! That there is a very good correlation between smoking and lung cancer is beyond dispute, but the tobacco companies' claim in years gone by that there is no causal link (often citing this very fallacy) is cynical and manipulative. There is a causal link – doctors have shown that the chemicals in cigarette smoke cause cancerous cells to develop. So do not always reject correlations as meaningless, but do treat them with caution.

A Here are some data which have been found to be closely correlated. For each case, find at least two explanations for the correlation. Explain whether or not you think it is likely that there is a genuine causal relationship. If there is, suggest the nature of the causal link. If not, explain why the correlation occurs.

- The number of cigarettes smoked is well correlated with poor school grades.
- Increases in UFO sightings are well correlated with increases in confectionery prices.
- The distance you run is well correlated with the time you spend running.
- Cancers are increasingly frequent in Switzerland, where a lot of milk is consumed, but relatively low in Sri Lanka, where very little milk is consumed.
- Profits of casinos are well correlated with teachers' salaries in Macau, China.
- Rises in profits of a particular company are well correlated with rises in workers' salaries.

B Find some examples from newspapers or magazines of correlations, and decide if there is any genuine causal relationship. Is a causal relationship suggested? Are the problems acknowledged?

C Are there problems of causation in the natural sciences? Give examples to illustrate your answer.

Determinism and free will

Whence and how do [my musical ideas] come? I do not know and I have nothing to do with it.

Mozart

The aim of the human sciences is to give us knowledge about individual humans and how these humans interact in their societies. They also aim to tell us what influences us, how we make our decisions and what factors might be important in doing so. Of course, the task is not easy, and there are always problems when looking for reliable knowledge. As we have seen in the last few sections, the human sciences present us with some unique difficulties. There is, however, an issue which seems to be either the greatest problem of all or the solution to all other problems, depending on how you look at it. The issue is that of free will. Does it exist? Do we really have the freedom to do what we want, or are we just responding to some combination of our nature and our nurture? This is a philosophical problem which has been examined for literally thousands of years. It is one which many great philosophers claim to have solved, sometimes in radically different ways. But somehow, the solutions do not seem to answer the nagging doubts that many people feel when they think hard about it. To see why the problem is such a thorny one, we will build up to it with a few examples.

The destruction of the space shuttle *Challenger* was an event that will live forever in the memories of anyone who saw it. Instead of a triumphant ascent into space, the craft dissolved into a fiery ball of burning fuel and oxygen. What should have been a great moment in the exploration of space turned into a national disaster and a human tragedy. The subsequent investigation found the cause of the explosion: a component of the fuel delivery system had cracked due to the low temperatures on the day of the launch and the rocket fuel had leaked and ignited. The faulty component had been manufactured years prior to the shuttle launch and, on a cold day, was always going to fail. No matter how expert the astronauts, how rigorous the training, how brilliant the engineers, if it launched on a cold day, that shuttle was going to blow up. The physical state of the damaged component was such that there was no way the shuttle could have survived. Thus the disaster was, in some sense, inevitable.

Consider now the man who decides to commit suicide, and who throws himself from a very high building, but who changes his mind on the way down. Imagine him flailing his arms, and shouting. It is all to no avail; he will hit the ground. There is nothing in the situation which gives him any freedom to do anything except fall. The force of gravity acts on every particle in his body and, irrespective of his wishes, he cannot do anything but fall. Again, the position is one of unavoidable forces doing what they do. Once the man has jumped, the outcome is preordained, and all the man's protests to the contrary are meaningless.

Once the shuttle had launched, and once the man was falling, the final outcomes were fixed. The principle seems to be that once certain conditions are met, the laws of the physical world take over and the outcome is determined. Now let's imagine ourselves making some decision. It is made in the brain, which operates according to physical laws just like everything else. Our memories/experiences/preferences are physically encoded in synaptic structures, our senses pass information in electrochemical signals, and the brain processes these signals in an extraordinarily complex way, but one which is fully grounded in chemistry and biology. Just as gravity operates independently of our wishes, so too do the laws of chemistry and biology. So how does the decision get made? Presumably by the laws of the physical world. If this is the case, there is simply no room for us to have any say in the matter. If you believe this then you are said to be a **determinist**, in that you believe that all choices are determined by the physical conditions that come before them.

A computer analogy may be helpful here (although some philosophers have not thought so). Why does a word-processor refuse to print a document? Is it because it finds it offensive, because it is tired, because it has exercised a free choice? These seem ridiculous suggestions. Of course, a word-processor may refuse to print (we have all been there!), but if so it is for a physical reason, not because the word-processor has made a choice. A state of affairs has prevented printing, and once that state has been identified it can be altered – thus allowing or, more precisely, forcing the printing to occur. Determinists would suggest that we are exactly the same; we want to eat when something in our brain says so – maybe due to blood sugar levels, whether we are on a diet, etc. – but there is no choice involved. If someone could reach into our brain and somehow 'tweak' the right bit, we would decide to eat now, or in one hour's time, or whatever.

If we take this view as essentially correct, the consequences seem severe. If all our choices are determined by the events that came before them, and those events by those that came before them, and so on, then all the choices we make today can, in theory, be traced back as far as we like – right back to the start of the Universe! In other words, the whole of reality is totally determined. In 1820, Pierre Laplace imagined the situation where a being of sufficient intelligence, who knew for just one instant the position and velocity of every particle that exists, could work out the whole subsequent course of the Universe. For this being, nothing would be uncertain and the future, as the past, would be present to its eyes.

Of course, this may seem ludicrous after a little reflection – we think carefully about our actions, we weigh up pros and cons, we balance all sorts of factors and we certainly feel that we are free to decide for ourselves. The feeling of self-determination is absolutely overwhelming. We seem (at least to ourselves) to be free agents capable of doing what we will, and other people seem to have the same capabilities. We might think that we are not

like the falling man, or the doomed shuttle, because we can avoid our ending; unlike these examples we do not have to break the laws of physics to avoid our fate. We just make a decision and exercise our free will. Like many of the best philosophical problems, the arguments for and against determinism both seem very powerful.

A Do you choose your favourite colour of your own free will? That is, could you decide that your favourite colour is something else? You can certainly say the words, 'Now I no longer like blue best; green is my favourite' and stop wearing blue clothes in favour of green. But can you really make yourself prefer green to blue?

B If there is an omniscient God then he already knows your actions and choices before you do. Does this generate a problem for the concept of free will?

C When we say that we have free will, we mean that in any given situation we could have done something other than what we actually did. Let us examine that a little more carefully. Is there any actual evidence that we could have done something other than the thing that we actually did? Explain your answer carefully.

D There are at least two factors that influence decisions we make – our inherent nature and the environmental nurture we have experienced. Are there any other factors which do not fall into one of these two categories? Do we have any choice over these categories?

E The brain appears to operate according to scientific laws. Does this leave any room for free will? If so, how?

F Camus wrote: '*In a universe divested of illusions and lights, man feels an alien, a stranger. His exile is without remedy since he is deprived of the memory of a lost home and the hope of a promised land.*' Suppose it were to be discovered that we do, indeed, have no free will at all, that we are robot-like and all our choices are pure illusions. What impact would this have on your life? Think particularly about your ethical and religious beliefs.

The philosopher Wittgenstein once invited his audience to consider themselves as autumn leaves floating to the ground, saying to themselves, 'Now I'll go this way . . . now I'll go that way.' Think about yourself as a leaf blowing in the wind. The philosopher Spinoza said that if a falling stone could talk, it would say that it was falling of its own free will.

Most people find these illustrations depressing. To say that we have no free will would put us on the same level as puppets, with physical laws pulling the strings. The implications for our lives are frightening, and it is not hard to understand why determinism is sometimes seen as more than a little terrifying. Daniel Dennett writes that if determinism is true then:

one is falling, falling and watching, horrified; one's deliberative machinery is disengaged, wheels spinning futilely as the relentless inexorable drama plays itself out.

This might have deep implications for our views on ethics and justice, and for our paradigm of the place of humans in the Universe. However, many philosophers have felt that there are

powerful arguments against determinism. Some say that it is at least compatible with free will. They concede that everything has physical causes, but argue that this does not mean that we do not have free will (this view is called **compatibilism**). Others have suggested that determinism is either unimportant or wrong. The feeling that we are free is an overpowering one and if this is the case then there must be a fault with determinism, even if we can't find it.

A Recent physical theories suggest that some events on the tiniest (quantum-mechanical) scales are truly random, and are thus in some sense uncaused. If our brain works in this non-deterministic way, might that offer an avenue whereby free will can arise?

B Maybe the whole problem of determinism is a pseudo-problem. Robert Nozick wrote: '*No one has ever announced that because determinism is true thermostats do not control temperature.*' Daniel Dennett echoed this, suggesting that, '*determinism does not, in itself, erode control*'. If we are controlled by physical events, but those events are happening within our own brain, does that really matter? Doesn't that amount to free will anyway?

C If determinism is true, then we have no choice as to what happens. So why worry about it? Watching a film does not become pointless when we know the ending because we can enjoy the experience. We should sit back and enjoy the ride. Is this a possible solution to the problem or would a determined life be deeply unsatisfying?

In terms of our quest for reliable knowledge, whatever we think about determinism has implications. The issue underlies the whole of the social sciences – if determinism is true, then arguably the whole concept of choice and action requires a fairly radical change of perspective. For the most part, we certainly live our lives as if we have free will, though we always acknowledge that we have to take into account in-built factors (which we now know are genetic in basis) and environmental factors (such as our education, background and circumstances). This leads us to the (in)famous issue of nature/nurture.

The nature/nurture debate

If the misery of the poor be caused not by the laws of nature, but by our institutions, great is our sin.

Charles Darwin

Nowhere do the links between human sciences, natural sciences, paradigms, language, ethics and politics become more obvious than in the nature/nurture debate, and over few other issues do tempers run as hot. The issue is easily stated: is my intelligence/personality/whatever due to my intrinsic biological nature or due to my upbringing and environment? **Genetic determinism** and **environmental determinism** are the two extreme responses, whereby nature or nurture respectively is said to be completely dominant.

Many books and articles have been written supporting both extremes and all intermediate positions. Of course, debates in scientific circles are hardly rare – indeed they are the very lifeblood of any academic subject – so why is this particular one

worthy of special consideration? The reason is that the nature/nurture debate is central to social policy, especially with regard to race. For example, if characteristics are genetically determined, then racial group A may be less intelligent than average, group B more lazy, and group C downright immoral. If one or all of these groups is at the bottom of the socio-economic ladder, it could then be said that is where they deserve to be – they are naturally less able! Why waste money trying to fight nature? Perhaps all those social welfare programmes are a waste of time and the money should be redirected elsewhere. (It is not hard to guess which social group would benefit from this line of thinking.) In other words, emphasis on 'nature' rather than 'nurture' can reinforce and serve as a justification for racism.

Others argue that genetic determinism is nonsense; that all humans are created equal in ability, and that with similar experiences of family, education, healthcare and opportunity, all racial groups can succeed in any walk of life. Therefore, the racial divisions in most societies are the legacy of past and ongoing prejudices and they can be fought by social programmes. In 1925, James Watson wrote:

Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in, and I'll guarantee to take anyone at random and train him to become any type of specialist I might select – doctor, lawyer, artist, merchant-chief, and yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations and race of his ancestors.

However, we should note that if, like many physical characteristics, those in the brain are genetically determined, it may be that some characteristics are inherited. Therefore there may be racial characteristics. The linguist Noam Chomsky writes:

No one would take seriously the proposal that the human organism learns through experience to have arms rather than wings, or that the basic structure of practical organs results from accidental exposure. Rather it is taken for granted that the physical structure of the organism is genetically determined, though of course variation ... will depend in part on external factors.

The development of personality, behaviour patterns and cognitive structures in higher organisms has often been approached in a very different way. It is generally assumed that in these domains, social environment is the dominant factor. The structures of mind that develop over time are taken to be arbitrary and accidental; there is no 'human nature' apart from what develops as a specific historical product.

But human cognitive systems, when seriously investigated, turn out to be no less marvellous and intricate than the physical structures that develop in the life of an organism. Why, then, should we not study the acquisition of a cognitive structure such as language more or less as we study some complex bodily organ?

A Choose any personality trait – intelligence, friendliness, aggression, happiness. Do you think it is nature or nurture that forms this characteristic in people? Justify your answer carefully. Are the reasons you give based in evidence, reason or faith?

The idea that there is a fixed biological hierarchy smacks of Hitler's master race. It is a view which is unlikely to be favourable to anybody who isn't near the top of the pecking order, and the belief that some people or races are superior to others has been, and is being, put to violent and ugly use all over the world. Small wonder that many feel moral outrage at the idea that our capacities are innate and fixed genetically. However, at this point we should feel a little uneasy for at least two reasons.

- We might feel moral outrage at a theory, but we need to distinguish very carefully between our moral beliefs and our beliefs about facts. We may be morally outraged at the American intervention in Vietnam, or by the destruction of the World Trade Center, but we cannot therefore deny that these things actually happened. Similarly, we may be morally outraged if we find that our capacities are innate, but as seekers of reliable knowledge we should not shy away from the search. If it is true, then we may be left with difficult ethical issues, but burying our heads in the sand and ignoring the problem is not a responsible way forward.
- Even if all our traits are genetically determined, that does not mean that we can draw any moral conclusion whatsoever. We do not make moral judgements about tall people as opposed to short people, although height is, to be sure, strongly determined by genetics. Why should we feel differently about intelligence? Even if it turns out that one race is less intelligent than another, that would be no justification for treating one race as better than another. The distinction between positive and normative human science is absolutely clear here.

A Would you want to know if there was a biological hierarchy of intelligence?
B Do you think it would be good for society to know if there was such a hierarchy?
C Suppose some group in such a hierarchy turns out to be the least intelligent. Construct arguments to suggest that the group gets more, less and the same amount of education. Which argument is 'best'? On what principles do you base your argument? Are they positive or normative principles?

You have probably already thought that nature and nurture interact, and that both extremes are obviously wrong. Perhaps the way forward is to determine the relative importance of each factor? Is it 40 per cent nature and 60 per cent nurture? Or precisely equal at 50 : 50?

Although this approach might seem appealing, it is ultimately futile. One can imagine few things more foolish than two pianists arguing about how a piano makes sounds; one says that it is because of the impact of the hammer on the strings inside the piano (the natural qualities of a piano); the other says that it is because the player presses the keys down (the environment of the piano). Unable to agree, they decide that it is some

combination of the player and the strings and resolve to investigate whether the relative proportions are 60 : 40 or 80 : 20. Clearly, this is totally meaningless. Without either, nothing happens. Similarly nature and nurture in humans are not opposites. They do not lie at opposite ends of a spectrum as competing forces. Nature is 100 per cent important and nurture is 100 per cent important. To contrast them is an artificial and outdated notion.

The linguist Stephen Pinker asks us to imagine the most sophisticated computer available – it has the fastest processor, gigabytes of RAM, terabytes of disc storage, a 3D virtual reality display, speech recognition and output, wireless internet access, and hundreds of built-in software modules. In other words, it has a very, very complex nature. Does that mean that, whatever we type into it, it will always respond in the same way, that the environment is unimportant? Of course not! In fact, the very reverse is true – the built-in complexity allows the machine to respond in complex ways, and the more complex the built-in machinery, the more complex the reaction to inputs.

The analogy with humans could not be clearer. Nature and nurture cannot be separated in any meaningful way. Without at least the innate capacity to learn, the environment could not have any effect. If we had no innate capacities we would be inanimate. Let's leave the last words to another scientist, Stephen Jay Gould, who has written extensively on the subject.

Of all the baleful false dichotomies that stymie our understanding of the world's complexity, nature vs. nurture must rank among the top two or three (a phoney division only enhanced by the euphony of these names).

Can we use a scientific approach with humans?

As soon as questions of will or decision or reason or choice of action arise, human science is at a loss.

Noam Chomsky

Now that we have seen several of the issues and problems, let us list and summarise the objections to the application of the 'scientific method' in the human sciences, and see whether or not they are good grounds for making vital distinctions.

1 **All humans are unique individuals; there can be no laws that apply to them all.** This is a common objection, but a little thought shows that it is far from certain. For example, in everyday life we tend to find that men and women behave differently and we treat people differently according to their sex. We can discuss whether or not it is right to make gender distinctions, and argue about nature or nurture (as we have done), but the brute fact remains that there are characteristics common to large classes of humans. This is not a dehumanising thing – underlying unities do not necessarily conflict with our uniqueness as individuals. We can study photosynthesis without demanding that all plants are the same. Why then should laws describing human behaviour require that all humans are identical?

It is certainly at least possible that humans share deep underlying patterns of behaviour. We cannot dismiss this out of hand without looking at the evidence carefully and without prejudice – that is, it is a matter for scientific enquiry, not armchair philosophy.

2 **Human sciences can never make accurate predictions with which to test theories**. It is certainly true that predictions in human sciences are extremely difficult to make, whereas physicists can sometimes predict results to ten decimal places. However, this is a difference of degree and not kind; no sociologist would hesitate to predict that an openly homosexual man will not be elected to be governor of the American state of Kansas, and no physicist would care to predict the path of a cork floating down a river. It may be that the human sciences are in their infancy, and that we will see extremely accurate predictions in the future. Again, this is a matter for open-minded scientific investigation.

3 **In the human sciences you cannot generate laws because the objects are always moving – there are no constants**. This is in marked contrast to the natural sciences where there are universal and unchanging (as far as we know) constants of nature (such as the speed of light in vacuum). It is true that human scientists have no such bedrock of stability, but as explained in point 1, that is not to say that there are no constants in human nature. Cultures and traditions may differ, but there may be deep underlying features. In the same way as rocks, trees, the sea and the air are superficially different, but are all made of molecules, all cultures and traditions might exhibit structural similarities, and it is the job of the human scientist to look for them.

4 **You cannot measure social data in numerical form as you can in the natural sciences**. This is certainly true at the moment – it is not possible to quantify things such as 'respect for elders' and 'social harmony'. Even numerical quantities, such as IQ and economic data, are often rather dubious measures. But again, even if this turns out to be a fundamental limitation of the human sciences, we cannot assume it from the start. Before the concepts of energy, force and work were clarified, the physical sciences were largely descriptive, and not readily amenable to quantification as they are now. The human sciences may one day find their Newton, and all may change.

5 **In the human sciences, an experimenter can change the thing he is trying to investigate; there is an unavoidable interaction between subject and scientist**. There are clearly cases where this is true – imagine an expert economist predicting a massive fall in the stock market, or that certain social groups are less likely to be successful at work. In both cases, the statements may become self-fulfilling (it is also possible to imagine self-defeating predictions). The problem is that of a conscious and freely-acting subject who can decide to do exactly what he is not supposed to. This is in marked contrast to all the natural sciences – an astronomer's

prediction of the next sighting of Halley's comet will hardly speed or delay its return! So there is some truth in this problem, but there are similar issues in the natural sciences – for example, to measure the speed of a particle requires interaction of some sort, and hence a change in the speed of the particle. In quantum mechanics, this principle is fundamentally limiting. In any case, in sophisticated social theory we can imagine taking all these interactions into account – so again, this is no reason to assume that human sciences will fail.

6 **Social issues cannot be studied like sciences because you can't control variables or repeat experiments; whole areas are inherently irreducible**. There certainly are problems here. If we want to investigate inflation and its link to unemployment, we cannot hold manufacturing output, exchange rates, wage increases, money supply and other relevant variables constant while we carry out our investigation. In fact, we probably couldn't even identify all the relevant variables in many cases, and even if we could control them that would (arguably) invalidate the whole experiment! So the *ceteris paribus* assumption in economics is simply unrealistic, and things in, say, psychology are still more complicated! But this is also a little unfair. Experiments in meteorology, geology and astronomy can also be difficult or in many cases impossible – scientists have to make simplifying models and to deduce what they can, recognising that the model is just that, and extrapolating its results with great care. There may or may not be ways to overcome experimental problems, but we won't find solutions by assuming that there are none.

7 **The human sciences are permeated with values in a way that the natural sciences are not; they are normative as well as positive**. That the human sciences can be normative is indisputable, but surely the same can be said of the physical sciences as well, though perhaps to a lesser degree. In studying the reaction of organic acids with plastics, there may be few obvious questions of value, but that is not to say that all natural sciences are purely objective and value free. When a new drug is being developed we must ask what risks we are prepared to put up with, and for what benefit. A drug that cures cancer but induces early arthritis would be very popular; one which cures headaches but with the same side-effect would never reach the market. In building a bridge, it may be possible to spend a hundred times as much money to ensure that the risk of collapse falls from one in a million to one in ten million. Should the extra expense be laid out? There are issues of the value of human life involved here, in addition to the science. In the big picture we can see that, for example, Darwin's science of evolution is changing our values radically.

So the human sciences are not alone in dealing with issues of value, and we can make a case that natural scientists have a long history of abdication from responsibility. Along with all their

benefits, scientific advances have been partially responsible for physical, chemical, biological and nuclear weapons; the depletion of the ozone layer; Chernobyl; global warming; loss of rainforest and natural diversity and so on. Perhaps natural scientists should take a more active interest in the application of their advances, and in the implication of their work for the general good of humankind.

A Examine the objections above and the responses. Find an example for each of the objections and discuss whether or not the objection raises a fundamental distinction between human and natural sciences.
B Are there any other objections to the application of the scientific method to the study of humans? Evaluate them carefully.

There is a natural tendency to believe that the study of our behaviour should be somehow different in principle to that of chemicals, and that no scientist will ever fathom our motives, thoughts and interactions. Our paradigm of self-worth and individuality is threatened by a science that 'explains' humans. However, paradigms sometimes come to an end and must be replaced if they can be shown to be based on error. In any case, as will be suggested below, even if humans can be 'explained' right down to the 'last detail' (whatever that might mean), our dignity and value as humans cannot be explained away, and we should not fear to look at ourselves for fear of what we might find.

Of course, it may be that the human sciences are doomed to failure; maybe we are incapable of understanding ourselves and our societies. This is a possibility which may also arise in the natural sciences, but there we are studying objects which are external to us. In the social sciences, there is an additional factor – *we are studying the thing which is doing the studying* – and this raises an interesting possibility. The more complex we are, the better equipped we are to study ourselves, but the more difficult a job we have. Conversely, the less complex we are, the easier we are to investigate, but the less able we are to comprehend ourselves! We can (arguably) understand some animals' social behaviour, but they (presumably) can't. So are we intelligent enough to understand ourselves? Emerson Pugh once quipped, '*If the human mind was simple enough to understand, we'd be too simple to understand it.*' There may well be truth in that.

But we are getting ahead of ourselves. If there are practical limits to our understanding of ourselves, then so be it. We cannot be sure about that purely by engaging in this sort of abstract speculation. The scientific method is the best tool we have for discovery; we would be foolish to dismiss it out of hand. Human science may not be quite the same as natural science, but whoever said that it had to be? As good philosophers, the theoretical objections should inform and guide our inquiries, but as good scientists, we should go ahead and do the experiments which will confirm or falsify our best theories as to the nature of (social) reality.

How much can the human sciences tell us?

You cannot acquire experience by making experiments. You cannot create experience. You must undergo it.

Albert Camus

Imagine a world where the human sciences reign supreme, where new concepts and theories have been elucidated, developed, refined and perfected. Crime, poverty and all manner of social ills have been eradicated by the development of social technologies based on these theories. The social world is a happy, peaceful and totally managed one, and no citizen of the future would wish it otherwise – indeed they cannot imagine how bad it must have been before the incredible breakthroughs of the twenty-second century! When a problem arises in their world, the human scientists set up the mathematical models, run some computer simulations and perform a few validating experiments. They then give a practical and efficient solution which accurately predicts how to set up situations such that the general population will, of their own free choice, behave in such a way as to rectify the problem.

Let us ignore, for a moment, whether or not this society is a 'good' thing. Consider instead the implications of this scenario coming to pass.

A Would our lives then be 'described' or 'explained' in some way?
B So do these theories tell us everything about us that is important?
C Is there anything about us that escapes explanation? Or are we, in this scenario, just parts of a social scientific theory and nothing more?

Here we might reflect a little on the limitations of the scientific approach. Reading any scientific textbook it is clear that science necessarily deals in types – 'a *sample* of phosphorus'; 'a *specimen* of *e coli*'. Science is not, and cannot be, interested in individual cases except in so far as they conform to given types. That is the whole point of science – to make generalisations about classes of objects and to see beyond the differences to the underlying shared characteristics. Thus, as far as science is concerned, specific characteristics are of no interest – it cannot deal with them and they have no place in the scientific canon. But it is precisely our individuality and uniqueness that make us who we are as humans, regardless of our shared general characteristics. In a *New York Times* obituary, Eudora Welty writes of author Victor Pritchett:

The characters that fill [his stories] – erratic, unsure, unsafe, devious, stubborn, restless and desirous, absurd and passionate, all peculiar unto themselves – hold a claim on us that cannot be denied. They demand and get our rapt attention, for in the revelation of their lives, the secrets of our own lives come into view. How much the eccentric has to tell us of what is central.

Most of our bodies are pretty similar as far as science is concerned (which is just as well if you are a surgeon), but to us as human beings, living and experiencing our lives every day, some bodies seem very different to others. Why is it that I love watching sunsets? Maybe science can find the circuits of the brain that are involved in appreciating colourful scenes, but surely no scientist can ever describe in scientific language what it is actually like for me to sit on the beach and bask in the final rays of the day. This extends to all of our experiences. What is it like for you, now, to be reading this page? What was it like for Neil Armstrong to set foot on the moon? What is it like to parachute? What is it like to think that you are going to die? What is it like to sneeze? What is it like to have sex? What is it like to fall asleep?

Thus any type of science, natural or human, will always fall short of some types of knowledge. No matter what wonderful theories and technologies are invented or discovered, some central and vital parts of our lives cannot, by their very nature, be explained by science in a meaningful way. Therefore we should never fear scientific explanation – if it misses such a central part of our being, if it has nothing to say about us as individuals, then it will never impinge on human dignity and human life.

A Try to answer some of the 'What is it like to . . .' questions above. What does this tell you about the limits of sciences and languages?

B Consider the future world described at the beginning of this section. Given what has been said, do you think the people in this world are in any way impoverished by the scientific knowledge that they have?

Where do we go from here?

So do the human sciences offer us a reliable and coherent way of knowing? It should be clear that this really depends on what type of 'knowledge' we are looking for. It is possible that the human sciences are converging with the natural sciences, so perhaps we should stick our necks out (hoping that the future will not chop them off!) and suggest that one day the human sciences will hold the same hope for qualified certainty as the natural sciences. However, the qualification is an important one. As we have seen, the natural sciences provide no sure route to absolute certainty and, even if they did, there are still aspects of human existence which seem to be beyond the scientific approach in principle. If we are to find ourselves with knowledge about ourselves, then perhaps we need to look at lived human life and actual human experience. Perhaps it is time we turned to history.

Further reading

Jay Gould's handling of IQ in *The Mismeasure of Man* (W. W. Norton, 1981) is lengthy but brilliant. Philip Davis and Reuben Hersh tackle the issue more generally in *Descartes' Dream* (Harvester Books, 1986). A reasonably technical but readable and rich account of the emerging discipline of decision theory (which attempts to model how humans actually make decisions) can be found in Stephen Watson's *Decision Synthesis* (Cambridge University Press, 1977).

The issue of free will is brilliantly introduced in Chapter 6 of Donald Palmer's *Does the Centre Hold?* (Mayfield, 1991) and is further explored in Daniel Dennett's *Elbow Room* (MIT Press, 1984). For a case study on psychology, try Adrian Furnham's *All in the Mind* (Whurr, 1996). General reflections on human nature, with an emphasis on language, can be found in the early chapters of Noam Chomsky's *Powers and Prospects* (Pluto, 1996). The links with the natural sciences are superbly and controversially explained in Edward Wilson's *Consilience* (Vintage, 1999), Matt Ridley's *The Red Queen* (Penguin, 1993) and Stephen Pinker's *How the Mind Works* (Penguin, 1998). A broader, far more philosophical (and far more difficult) approach is taken by John Searle in *The Construction of Social Reality* (Penguin, 1995).

Testing: a case study in the social sciences

An extract from *Descartes' Dream* by Philip Davis and Reuben Hersh.

In order to 'mathematise' society – to convert it to a form where it can be processed by a digital computer – it is first of all necessary to mathematise society's principal components – people. To mathematise people means to encode them, or to represent them, by sequences of zeros and ones.

In many respects, we are already encoded. Our medical records are essentially lists of numbers: blood pressure and pulse at various times, blood counts (note the arithmetical turn of phrase) and so forth and so on. Our school records, or 'transcripts' as they are called, are also lists of numbers, denoted by the special term of 'grades'. You realise that 'letter' grades are also arithmetical. One need only decode from A, B, C, D, E to 1, 2, 3, 4, 5. And then there are our tax records at the IRS. Numerical indeed!

But these numbers don't suffice for the purpose of mathematising society. The principal social function of each of us is not as a pupil or a patient. It is, as an employee or worker, to participate in the economy. So our places and positions in the economic system have to be mathematised or digitised.

How do we do this? We take a test! The nation's grand central test-maker, the Educational Testing Service of Princeton, NJ., sells tests to the CIA, the Defence Department, the National Security Council, the government of Trinidad and Tobago, the Institute for Nuclear Power Operations, the National Contact Lens Examiners, the International Council for Shopping Centres, the American Society of Heating, Refrigerating and Air-Conditioning Engineers, the Commission on Graduates of Foreign Nursing Schools, the Malaysian Ministry of Education, the National Board of Podiatry Examiners, and the Institute for the Advancement of Philosophy for Children. In some parts of the country you cannot become a golf pro, a real-estate salesman, a certified consultant, a certified auto mechanic, a merchant marine officer, a fireman, a travel agent, a certified business-form consultant, or, in Pennsylvania, a beautician or a barber, without passing an ETS test. And we have not even mentioned the great vortex and centre of testing; the schools – from kindergarten through graduate school. The tests we take in K-12 are a major part of our work file, the raw material for the computation that will determine what kind of work we get to do and how much we get paid for doing it.

In June 1985, an unexpected and tragic death occurred in Jakarta. The Indonesian Minister of Education and Culture, Professor Nugroko Notosusanto, suffered a brain haemorrhage, at the age of only 54 years. He was buried at the Heroes Cemetery, Kalibata, with full military honours. According to the Jakarta press, Dr. Notosusanto brought about a major reform in Indonesian education. He established a uniform nation-wide test for completion of secondary school. Unfortunately, almost all the candidates failed the test. To correct this calamity, he decreed that the test results should be 'curved' – that is, fitted to a normal bell curve. When this was done, the result was that almost everyone passed the test. This, it seems, was a second calamity. Dr. Notosusanto was quoted as saying, 'It seems no matter what I do people are angry at me.' (Rough translation from Indonesian.)

At any rate, he had been in good health so far as his friends and family knew. This double calamity of testing was the only source of stress in his life mentioned in the press. Dr. Notosusanto's most notable accomplishment (again according to the Jakarta press) was an

increased emphasis on religion (Islam) and history (Indonesian history as a tool in 'nation-building'). He was regarded as a sensitive, conscientious man, very faithful to duty. In view of that description, it seems possible that he was actually killed by the stress due to the problem of testing.

It's worth giving a moment's thought to this sad story. It casts in sharp focus the issue of what testing is really all about.

In particular, it is not just a matter of examining the students (i.e., in the simple literal sense of the word, looking them over), deciding which are OK, by some clear cut, 'objective' standard, and which are not OK and then labelling them as such. If that were the case, it would be inconceivable that the same set of high-school graduates taking the same exam would nearly all pass on one day and nearly all fail on another day. Rather, a test, as it is used nowadays in modern societies such as the U.S.A. or Indonesia, is a partition device, a method for sorting a population into two sub-populations. The first sub-population will be admitted to some desired status. The second will be excluded.

Testing is also a way of putting people into computable form. Such and such a score means such and such a rank in the bureaucratic hierarchy. The decision can be automatic (capable of being carried out by machine) and objective (no human being appears openly to whose prejudices the decision can be attributed). Being automatic and objective, it may appear to its recipients or victims as something God-given; that is, inevitable, eternal, and unquestionable. In truth, of course, it is the opposite; it is temporal and questionable and avoidable.

There are two crucial questions about testing: is it accurate? and is it harmful? In other words, does it fulfil its intended purpose? and does it do harm in other respects? On the first point, the answer is that, when properly done, testing does carry out a certain task accurately. This task, however, is related to, but not identical to, that originally envisioned. Take intelligence testing, for example. Does an IQ test measure intelligence? It measures something; for it does have, within reasonable tolerance, the statistical attribute called 'reliability'. Reliability tells us that a statistical measure (i.e., IQ score) is meaningful. The question is, what meaning? Are we measuring intelligence or something else?

The IQ is exact. It is a number. Intelligence, on the other hand, is an amorphous, verbally-defined quality. How could they be the same? IQ purports to be in some sense an approximation or equivalent to intelligence. How could we justify or prove this claim for IQ? In order to do so, we would have to analyse 'intelligence' into its various manifestations: ability to solve problems, to succeed in difficult situations, to behave in the most appropriate manner. But, *what kind* of problems or situations? A quick glance at an IQ test will show that the only problems and situations for which the IQ questions are pertinent are classroom or academic ones. The IQ test is really just an instrument for predicting success in school. (And far from infallible, even at that!) It has little bearing on occupational or professional success or success in business, in love, or in the other testing grounds of life. There is a dramatic meaning-shift in passing from the 'intelligence' of ordinary language to the 'I' of IQ.

While IQ is a reasonable predictor of success in school, it is of course not the same as success in school. Some people with a relatively low IQ do well in school, and some people with a high IQ do badly. What then, really, is IQ? The only honest answer is, it is what it is. More wordily, the IQ score is a measure of one's ability on the IQ test. If someone chooses to use it with another meaning than that, he does so at his (and his victims') risk.

The same argument applies to any other 'objective' test of some 'aptitude' or 'ability'. The test does not measure exactly the aptitude or ability we are interested in, but, rather, some artefact brought into being by the invention of the test. As a consequence, test-taking ability becomes a new and crucial 'aptitude' for getting ahead in the world. This is no joke. The coaching for various tests (Medical School Aptitude Tests, Law School Aptitude Tests) has become a substantial industry in itself. In many medical schools, whose students must pass the nationwide 'Board' exams after two years, the faculty supply their students with substantial, systematic coaching on exam-taking strategy. Would not those students' ☞

future patients be better served if the exam were cancelled and the extra time spent on pharmacology or anatomy?

This leads into our second issue: aside from its accuracy or inaccuracy in its intended measurement, does 'objective testing' do any positive harm? On this issue tremendous controversies are raging. For instance, it is claimed that IQ tests and other 'objective' tests are culturally biased. There is no question that results of these tests are being used to justify claims of inferiority of the non-white part of our population.

It is obvious that tests could be written which consistently demonstrate Black superiority. As it happens, no one is seriously interested in writing and administering pro-Black IQ tests, whereas the present tests, which give Blacks, on the average, slightly lower scores, continue to be used. One rationale for these results is to say that many Black people are educationally and culturally deprived, and the test merely reflects this deprivation. There is nothing wrong with the test, only with the reality it reports. Although this defence may seem plausible, it is fallacious insofar as it treats the IQ as an objective, God-given measurement; we know the IQ is man-made and arbitrary.

A more serious defect in this defence of IQ is that it treats IQ as a purely passive intuition, something which merely reflects what is. On the contrary, the IQ also affects what is. IQ and other culturally biased tests are part of the apparatus which restricts and makes more difficult the attempts of many Blacks and other non-whites to rise in our socio-economic order. Naturally, these tests are attacked by the political organisations of Black people and their supporters.

For example, Arthur R. Jensen (*Straight Talk About Mental Tests*, 1981) has gained international fame by reiterating the claim that the average difference of 15 points between IQs of Blacks and Whites is genetic in origin. A strong attack on Jensen's view is contained in *The Mismeasure of Man* by Stephen J. Gould, 1981. Related in spirit to Gould's is *The Science and Politics of IQ*, by Leon J. Kamin, which details the connection of IQ tests with racism and anti-semitism ever since they were first brought to the U.S.

Most readers will choose sides according to their political and philosophical preferences. There are many citizens who are quite comfortable with the belief that objective tests have demonstrated that some folks are just superior to other folks. This kind of thinking is sometimes called 'conservative'. On the other side, people with a belief in social betterment or racial equality (liberals, Lefts, or what you will) are more likely to be convinced by Kamin's and Gould's arguments that IQ testing (and other similar 'objective' testing) are not merely objective measurements of reality, but are also instruments of social control for maintaining the status quo.

Since these remarks are, unavoidably, weighted on the liberal side, let us try to restore the balance by referring to a review in *Policy Review* (well-known as a 'conservative' journal) by Michael Levin, a well known 'conservative' professor of philosophy. Levin reviews both Jensen and Gould, praising Jensen and condemning Gould, as one might expect in view of his political orientation. Most of the review deals with the specific arguments of these two books, but, at the end, the political animus becomes overt: 'Peering out from between [Gould's] lines are our friends Marx and Lenin and . . . the new Left.' Thus does the mathematical element become politicised.

Race and politics aside, the effect of objective testing is to devalue those qualities which cannot be so tested. For example, in high-school English classes, multiple-choice tests have become very common, while essay tests have become less common. Consequently, the importance of learning to write has been greatly diminished both for teachers and for students.

As we mathematise the world, we proceed to lose or to throw away those parts of the world that cannot be mathematised. What isn't mathematised seems not to exist, even never to have existed.

We should never forget that a stroll in the woods or a deep conversation with a new or old friend are beyond mathematics. And then, when we go back to our jobs, as administrators, teachers, or whatever, let us still remember that numbers are only the shadow, that life is the reality.

Is economics a science?
Two views

An account from a chemist's point of view
by Arthur Williamson, First Vice President, New Zealand Institute of Chemistry.

Recently I have noticed that economists have begun to draw on some of the jargon and concepts of physical chemistry and are using ideas of thermodynamics to support their assertions about the possibility of continued economic growth. I guess this gives a thermodynamicist some reciprocal right to expound on the method of economics.

An aspect of economics which interests me is the relationship between theory and real behaviour. In both fields it appears that one can devise theories about the behaviour of a system and then use them to make predictions about the future behaviour of the system, which can then be compared with the actual behaviour. At this point physical science and economics seem to diverge. When actual and predicted behaviour differ, the physical scientist generally concludes that either the observations or the theory are in error. If the observations are trustworthy, then the theory has to be wrong. In economics there seems to be a third possibility which is illustrated by the current 'free-market' approach. In this case disagreement between prediction and actuality is often ascribed to 'market failure'. I imagine that the equivalent in physical science would be to say that a disagreement between theory and experiment is due to 'reality failure'. Perhaps even more mystifying to the physical scientist is the fact that the economist will then sometimes go one step further and propose a measure to 'correct' this 'failure'. This is equivalent to the physical scientist attempting to do something to bring reality more into line with the existing theory.

One must conclude that the relationship between theory and reality is indeed different in these two fields. Physical science aims at elucidating characteristics assumed to be inherent in the system and expressed in its behaviour, while economics seems to be about the construction of models and attempts to impose these models on the system. To my mind the ability that the economist has to 'interfere' with the object of his theory adds a dimension of subjectivity that is not present in physical science and suggests that there can be no inherent rightness in any particular economic theory.

A reply from an economist by Seamus Hogan, Department of Economics, McGill University, Montreal.

There are a number of similarities in the methodologies of physical science and economics. Unfortunately, the similarities in substance are not as great as the similarities in the language used to express the substance. A lot of our technical language is borrowed from the physical sciences (principally physics, since many of the economists who first brought mathematical rigour to the subject earlier this century had received their original training in physics). Naturally, the borrowed language has taken on its own meaning in economics, adapting to the differences in the disciplines. This can lead to misunderstanding if professionals from one area try to read material from the other.

One similarity between the physical sciences and economics is that both involve the systematic investigation of ☞

complex phenomena. The human brain has only a limited capacity to comprehend complex systems of interacting forces without an organising framework. One way of providing such a framework is to invest ideal worlds that contain many of the interactions that we wish to comprehend but are still relatively simple and can be used as benchmarks against which to test the real world.

For instance, a physicist might consider the dynamics of a body on a frictionless surface attached to an ideal spring (i.e. a spring that has no mass and gives rise to a restoring force that is proportional to the distance the body is displaced from rest). Obviously, ideal springs or frictionless surfaces do not exist, but it is easier to comprehend the observed behaviour of a spring by considering how the presence of friction or spring mass distort the dynamics that it is trying to model. Similarly, modern economic theory is built on a mathematical structure that can analyse the simultaneous interaction of all decision-making agents in an economy (consumers, firms, governments, etc.). This structure makes a number of simplifying assumptions that are palpably false, but, as with the ideal spring, it provides a benchmark, exceptions from which generate our comprehension of the real economic world.

One reason for calling the simplified worlds 'ideal' is that they often contain a number of desirable properties that one would like to approximate in practice (e.g. minimising friction can reduce the amount of energy that one needs to supply in order to achieve a particular amount of work). Since the economic benchmark also has some desirable properties, one set of real-world deviations from this benchmark are termed 'market failures'. To continue with the analogy, an economist's recommendation that economic policy be used to remove a market failure would be equivalent to a physicist's recommendation that lubricant be used to reduce friction.

Professor Williamson's final point is that 'the ability that an economist has to "interfere" with the object of his theory adds a dimension of subjectivity which is not present in physical science'. There is an important difference between physical sciences and economics in the methodology of connecting theory (in the physical-science use of the term) and reality. The most important of these is that economists can almost never use controlled experiments. One can think of a controlled experiment as being an attempt to create the conditions of an imagined 'ideal' world in order to isolate a small number of phenomena from the distractions of real world interactions. Economics certainly does have a 'dimension of subjectivity which is not present in physical science', but this is precisely because the economist cannot 'interfere' with the object of his theory in the way that a physical scientist can through the use of controlled experiments.